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SUMMARY OF GROUNDWATER CONDITIONS AT FIVE CITIES IN NORTHERN ILLINOIS

by

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This summary of the availability of groundwater for an industrial supply in the vicinity of Joliet, Morris, Ottawa, Henry, and Fulton is prepared at the request of Mr. Dick Dandurand, Department of Business and Economic Development, 30 North LaSalle Street, Room 808, Chicago, Illinois 60602.

JOLIET, WILL COUNTY

Large groundwater resources in this part of Will County are developed primarily from the shallow dolomite formations of Silurian and Ordovician age and from the deep-lying Cambrian-Ordovician aquifer, of which the Glenwood-St. Peter and Ironton-Galesville sandstones are the most productive formations.

Wells tapping the shallow dolomite aquifers in the Joliet area range in depth from around 250 to 450 feet with the nonpumping water levels varying with topography but generally about 50 feet below land surface. Studies of shallow dolomite wells in western Will County show that the median specific capacity of individual wells is about 5.5 gpm/ft (yield per foot of drawdown), although specific capacities may range from less than 0.1 to more than 200 gpm/ft. Individual well yields range from near zero to around 500 gpm depending on the number, size, and degree of interconnection of the water-bearing openings intersected by the bore hole.

Water from the shallow dolomite aquifers is fairly highly mineralized (500 to 1200 ppm) and very hard (300 to 1000 ppm).

The Cambrian-Ordovician aquifer is the principal aquifer tapped for large groundwater supplies in the Joliet area. The primary water-bearing units of the aquifer are the Glenwood-St. Peter and Ironton-Galesville sandstones. Wells tapping the Cambrian-Ordovician aquifer in the vicinity of Joliet generally range in depth from about 1600 to 1700 feet. Nonpumping water levels are between about 0 and 50 feet above sea level (about 600 to 700 feet below land surface) and declining at a rate of about 12 feet/year. Studies of yields of deep sandstone wells in northern Illinois indicate that the deeper Ironton-Galesville sandstone is about three times as permeable as the upper Glenwood-St. Peter sandstone, and that wells penetrating the entire thickness of the Cambrian-Ordovician aquifer generally have specific capacities (yield per foot of drawdown) about 5 times greater than specific capacities of wells finished only in the Glenwood-St. Peter sandstone. The specific capacity of deep sandstone wells in the Joliet area is about 6.5 gpm/ft. Individual wells are pumped at rates from about 300 to 1000 gpm.

Water from the deep sandstones at Joliet is generally hard (250 to 300 ppm) and moderately mineralized (450 to 600 ppm).

The practical sustained yield of the deep sandstones in northeastern Illinois has been exceeded in recent years and the future cost of pumping water from this aquifer system will increase as water levels continue to decline. For this reason it is suggested that if possible, the industrial wells be completed in the shallow dolomite rather than the deep sandstones.

MORRIS, GRUNDY COUNTY

Available information indicates that in the vicinity of Morris large quantities of groundwater are generally obtained from the deep-lying Cambrian-Ordovician aquifer system. The municipal wells at Morris tapping the full thickness of this aquifer are about 1450 feet deep. The piezometric surface is near an elevation of about 450 feet above sea level (about 70 feet below ground level in Morris) and declining at a rate of about 4 to 5 feet per year. The specific capacity (yield per foot of drawdown) of a well tapping the Cambrian-Ordovician aquifer should be about 7 gpm/ft; a well tapping only the Glenwood-St. Peter sandstone should have a specific capacity of about 2 gpm/ft. Individual municipal wells at Morris tapping these aquifers are pumped at rates of 450 to 1000 gpm.

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STATE OF ILLINOIS
DEPARTMENT OF ENERGY AND NATURAL RESOURCES

Public
14 wells in use

Public Groundwater Supplies in Will County

by DOROTHY M. WOLLER and ELLIS W. SANDERSON

ILLINOIS STATE WATER SURVEY
CHAMPAIGN
1983

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B40956) of a sample collected April 14, 1976, showed the water to have a hardness of 569 mg/l, total dissolved minerals of 792 mg/l, and an iron content of 5.5 mg/l.

WELL NO. 5, open to the Silurian dolomite, was completed to an unknown depth. This well has been disconnected. The well is located about 500 ft from the conference center at the north end of the grounds in a frame shed, approximately 50 ft S and 1650 ft W of the NE corner of Section 15, T34N, R13E. The land surface elevation at the well is approximately 780 ft.

The well is cased from the wellhouse floor to an unknown depth.

The pumping equipment presently installed is a submersible pump rated at about 15 gpm, and powered by 1-hp electric motor.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B40960) of a sample collected April 14, 1976, after pumping for 30 min, showed the water to have a hardness of 407 mg/l, total dissolved minerals of 441 mg/l, and an iron content of 2.2 mg/l.

GREENFIELD COMMUNITY WELL CO.

Greenfield Community Well Co. (est. 50), located on the southeast edge of Joliet, installed a public water supply in 1938. One well is in use. In 1974 there were 14 services, none metered; the estimated average and maximum pumpages were 2500 and 3000 gpd, respectively. In 1979 there were 14 services, none metered; the estimated average pumpage was 4000 gpd. The water is chlorinated and fluoridated.

WELL NO. 1, open to the Silurian dolomite, was completed in September 1938 to a depth of 120 ft by Mr. Belasich. The well is located at 815 Harlow Ave., approximately 450 ft S and 600 ft E of the NW corner of Section 23, T35N, R10E. The land surface elevation at the well is approximately 610 ft.

A 5-in. diameter hole was drilled to a depth of 120 ft. The well is cased with 5-in. pipe from about 0.8 ft above a pit cover to an unknown depth.

The pumping equipment presently installed is a Red Jacket submersible pump set at 100 ft, rated at 30 gpm, and powered by a ¾-hp electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B41121) is for a water sample from the well collected April 4, 1978, after 28 min of pumping at 28 gpm.

WELL NO. 1, LABORATORY NO. B41121

		mg/l	*me/l*			*mg/l*	*me/l*
Iron	Fe	0.0		Silica	SiO_2	12	
Manganese	Mn	0.00		Fluoride	F	0.2	0.01
Ammonium	NH_4	0.0	0.00	Boron	B	0.1	
Sodium	Na	22	0.96	Cyanide	CN	0.00	
Potassium	K	3.1	0.08	Nitrate	NO_3	0.9	0.01
Calcium	Ca	145	7.24	Chloride	Cl	53	1.50
Magnesium	Mg	76	6.26	Sulfate	SO_4	280	5.82
				Alkalinity (as $CaCO_3$)		344	6.88
Arsenic	As	0.00		Hardness (as $CaCO_3$)		678	13.56
Barium	Ba	0.1					
Cadmium	Cd	0.00		Total dissolved			
Chromium	Cr	0.00		minerals		875	
Copper	Cu	0.02					
Lead	Pb	0.00					
Mercury	Hg	0.0000					
Nickel	Ni	0.0					
Selenium	Se	0.00					
Silver	Ag	0.00					
Zinc	Zn	0.0		pH (as rec'd)		7.2	

HILL VIEW SUBDIVISION

Hill View Subdivision (est. 100), located just north of New Lenox, installed a public water supply in 1941. The water system is owned and operated by the Hill View Water Association. One well is in use. In 1963 there were 26 services, none metered. In 1980 there were 34 services; the average pumpage was 8120 gpd. The water is chlorinated and fluoridated.

WELL NO. 1, open to the Silurian dolomite, was completed in 1940 to a depth of 127 ft. The well is located at 1023 North Cedar Road, approximately 1400 ft S and 25 ft

INGALL'S PARK SUBDIVISION

Ingall's Park Subdivision (est. 805), located on the east edge of Joliet, installed a public water supply in 1930. The water system is owned and operated by the Ingall's Park Water Association. Two wells are in use. In 1961 there were 174 services; the average and maximum pumpages were 20,000 and 30,000 gpd, respectively. In 1980 there were 245 services, all metered; the average pumpage was 54,000 gpd. The water is chlorinated and fluoridated.

WELL NO. 1, open to the Silurian dolomite, the Maquoketa Group, and the Galena-Platteville dolomite, was completed in 1930 to a depth of 700 ft by the Heflin Well Drillers, Joliet. The well is located at the northwest corner of Peale St. and Fourth Ave., approximately 2550 ft S and 600 ft E of the NW corner of Section 13, T35N, R10E. The land surface elevation at the well is approximately 640 ft.

The well is cased with 6-in. pipe from about 0.2 ft above the wellhouse floor to a depth of 200 ft.

Nonpumping water levels were reported to be 30 ft on May 1, 1942, and 86 ft on May 27, 1970.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B41300) is for a water sample from the well collected April 6, 1978, after 30 min of pumping at 120 gpm.

WELL NO. 1, LABORATORY NO. B41300

		mg/l	me/l			mg/l	me/l
Iron	Fe	0.1		Silica	SiO_2	12	
Manganese	Mn	0.01		Fluoride	F	0.3	0.02
Ammonium	NH_4	0.1	0.01	Boron	B	0.1	
Sodium	Na	36	1.57	Cyanide	CN	0.00	
Potassium	K	2.4	0.06	Nitrate	NO_3	7.5	0.12
Calcium	Ca	120	5.99	Chloride	Cl	110	3.10
Mangesium	Mg	62	5.10	Sulfate	SO_4	132	2.75
				Alkalinity (as $CaCO_3$)		343	6.86
Arsenic	As	0.00		Hardness (as $CaCO_3$)		564	11.28
Barium	Ba	0.1					
Cadmium	Cd	0.00		Total dissolved			
Chromium	Cr	0.00		minerals		742	
Copper	Cu	0.01					
Lead	Pb	0.00					
Mercury	Hg	0.0000					
Nickel	Ni	0.0					
Selenium	Se	0.00					
Silver	Ag	0.00					
Zinc	Zn	0.0		pH (as rec'd)		7.3	

The pumping equipment presently installed is a submersible pump set at 221 ft, rated at 60 gpm, and powered by an electric motor.

WELL NO. 2, open to the Silurian dolomite, was completed in 1976 to a depth of 305 ft by the Lockport Well & Pump Co., Joliet. The well is located about 50 ft west of Well No. 1, approximately 2550 ft S and 550 ft E of the NW corner of Section 13, T35N, R10E. The land surface elevation at the well is approximately 640 ft.

Information on the hole and casing records are not available.

The pumping equipment presently installed is a 12-stage Red Jacket submersible pump set at 250 ft, rated at 100 gpm, and powered by an electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B18240) is for a water sample from the well collected October 27, 1976, after 30 min of pumping at 120 gpm.

WELL NO. 2, LABORATORY NO. B18240

		mg/l	me/l			mg/l	me/l
Iron	Fe	1.0		Silica	SiO_2	11.7	
Manganese	Mn	0.06		Fluoride	F	0.1	0.00
Ammonium	NH_4	0.2	0.01	Boron	B	0.2	
Sodium	Na	21	0.91	Cyanide	CN	0.00	
Potassium	K	2.9	0.07	Nitrate	NO_3	0.4	0.01
Calcium	Ca	121	6.04	Chloride	Cl	69	1.95
Magnesium	Mg	59	4.86	Sulfate	SO_4	120	2.50
				Alkalinity (as $CaCO_3$)		356	7.12
Arsenic	As	0.00		Hardness (as $CaCO_3$)		546	10.92
Barium	Ba	0.1					
Cadmium	Cd	0.00		Total dissolved			
Chromium	Cr	0.00		minerals		646	
Copper	Cu	0.01					
Lead	Pb	0.00					
Mercury	Hg	0.0000					
Nickel	Ni	0.0					
Selenium	Se	0.00					
Silver	Ag	0.00					
Zinc	Zn	0.1		pH (as rec'd)		7.3	

JOLIET

The city of Joliet (80,378) installed a public water supply in 1884. Water was supplied by a private company until 1888 when the city purchased the company. Fourteen wells (Washington St. No. 1, Ottawa St., Spruce Slip, Jasper St., Williamson Ave., Campbell St., Essington Road, Gravel Wells 1-5, and Rock Wells 1 and 2) are in use. Water from this supply is also furnished to the Lockport Township Water System and to the village of Rockdale. The supplies of Crest Hill and Preston Utility Co. are cross connected to Joliet. In 1951 the average and maximum pumpages were 5,620,000 and 6,430,000 gpd, respectively. In 1980 there were 20,973 services, all metered; the average pumpage was 13,550,780

gpd. The water is chlorinated; water from Gravel Wells 1-5 and Rock Wells 1 and 2 is also filtered.

Initially, water was obtained from twenty 6-in. diameter wells finished in sand and gravel to depths of about 40 ft. These wells were abandoned prior to 1960. The wells were located in the valley of Hickory Creek north of Washington St., west of the Elgin, Joliet & Eastern RR in the eastern part of the city in the northwest quarter of Section 14, T35N, R10E. These wells supplied the city until a supplementary supply consisting of the first six deep sandstone wells were drilled.

At times water was taken from Hickory Creek and from a stone quarry nearby to supplement the city supply. These sources of supply were abandoned after about 1930.

A description of the sandstone wells at the Washington St. Pumping Station follows:

OLD WELL NO. 1, open to the Cambrian-Ordovician aquifer, was completed prior to 1900 to a depth of 1785 ft. This well was abandoned in 1937 and sealed between 1948 and 1960. The well was located north of Washington St. west of the Elgin, Joliet & Eastern RR, approximately 445 ft S and 1350 ft E of the NW corner of Section 14, T35N, R10E. The land surface elevation at the well is approximately 565 ft.

A 12-in. diameter hole was drilled to a depth of 553 ft and finished at an unknown diameter below 553 ft. The well was cased with 8-in. pipe from about 3 ft above the bottom of a pit floor to a depth of 400 ft.

In 1896 and 1899, the well reportedly flowed.

Nonpumping water levels were reported to be 40 ft in 1900 and 209 ft in 1923.

A mineral analysis of a sample (Lab. No. 68211) collected December 17, 1930, showed the water to have a hardness of 311 mg/l, total dissolved minerals of 624 mg/l, and an iron content of 0 mg/l.

OLD WELL NO. 2, open to the Cambrian-Ordovician aquifer, was completed prior to 1900 to a depth of 1600 ft. This well was abandoned in 1937 and sealed between 1948 and 1960. The well was located about 20 ft north of Well No. 1, approximately 425 ft S and 1345 ft E of the NW corner of Section 14, T35N, R10E. The land surface elevation at the well is approximately 565 ft.

The well was cased with 6-in. pipe from about 3 ft above the bottom of a pit floor to a depth of 400 ft.

In 1896 and 1899, the well reportedly flowed.

In 1900, the nonpumping water level was reported to be 40 ft.

OLD WELL NO. 3, open to the Cambrian-Ordovician aquifer, was completed prior to 1900 to a depth of 1600 ft. This well was abandoned in 1937 and sealed between 1948 and 1960. The well was located about 130 ft north of Well No. 1, approximately 315 ft S and 1350 ft E of the NW corner of Section 14, T35N, R10E. The land surface elevation at the well is approximately 565 ft.

The well was cased with 4-in. pipe to a depth of 400 ft.

In 1896 and 1899, the well reportedly flowed.

In 1900, the nonpumping water level was reported to be 40 ft.

OLD WELL NO. 4, open to the Cambrian-Ordovician aquifer, was completed prior to 1900 to a depth of 1686 ft (measured in 1929 at 1409 ft deep). This well was abandoned about 1933 and sealed prior to 1960. The well was located about 210 ft north of Well No. 1, approximately 235 ft S and 1350 ft E of the NW corner of Section 14, T35N, R10E. The land surface elevation at the well is approximately 565 ft.

The well was cased with 8-in. pipe from land surface to a depth of 400 ft.

In 1896 and 1899, the well reportedly flowed.

Nonpumping water levels were reported to be 40 ft in 1900, 209 ft in 1923, 248.7 ft in October 1929, 229.2 ft in October 1933, and 324 ft in 1942.

OLD WELL NO. 5 (also known as Washington St. Well No. 2), open to the Cambrian-Ordovician aquifer, was completed prior to 1900 to a depth of 1704 ft (cleaned out in 1934 to 1665 ft and in 1937 to 1611 ft). This well was abandoned about 1948 and sealed in 1952. The well was located about 367 ft north of Washington St. and 250 ft west of the Elgin, Joliet & Eastern RR, approximately 160 ft S and 1500 ft E of the NW corner of Section 14, T35N, R10E. The land surface elevation at the well is approximately 565 ft.

A 12-in. diameter hole was drilled to a depth of 450 ft, reduced to 10 in. between 450 and 610 ft, reduced to 8 in. between 610 and 1300 ft, and finished 6 in. in diameter from 1300 to 1704 ft. The well was cased with 8-in. pipe to a depth of 400 ft.

In 1896 and 1899, the well reportedly flowed.

Nonpumping water levels were reported to be 40 ft in 1900 and 209 ft in 1923.

In December 1929, the well reportedly produced 800 gpm with a drawdown of 141 ft from a nonpumping water level of 240 ft.

In October 1933, the nonpumping water level was reported to be 223.2 ft below the top of the well.

In 1934, J. O. Heflin, Joliet, shot this well with 52 qt of nitroglycerin at a depth of 1600 ft. The well was cleaned out and was reported to be 1665 ft deep.

In 1937, this well was shot with 50 lb of dynamite at 1540 ft and cleaned out by C. W. Varner, Dubuque, Iowa. After shooting, the well reportedly produced 450 gpm for 14 hr with a drawdown of 114 ft from a nonpumping water level of 242 ft below the top of the casing.

In 1940 and 1941, the nonpumping water level was reported to be 238 ft.

A mineral analysis of a sample (Lab. No. 79943) collected April 22, 1937, showed the water to have a hardness of 288 mg/l, total dissolved minerals of 535 mg/l, and an iron content of 0.4 mg/l.

OLD WELL NO. 6, open to the Cambrian-Ordovician aquifer, was completed prior to 1900 to a depth of 1419 ft. This well was abandoned in 1937 and sealed between 1948 and 1960. The well was located about 450 ft east of Well No. 4, approximately 240 ft S and 1800 ft E of the NW corner of Section 14, T35N, R10E. The land surface elevation at the well is approximately 565 ft.

A 12-in. diameter hole was drilled to a depth of 455 ft and finished at an unknown diameter below 455 ft. The well was cased with 6-in. pipe to a depth of 400 ft.

In 1896 and 1899, the well reportedly flowed.

Nonpumping water levels were reported to be 40 ft in 1900 and 209 ft in 1923.

A mineral analysis of a sample (Lab. No. 68216) collected December 17, 1930, showed the water to have a hardness of 344 mg/l, total dissolved minerals of 624 mg/l, and an iron content of 0 mg/l.

WASHINGTON ST. WELL NO. 1 (also known as Well 5D), open to the Cambrian-Ordovician aquifer, was completed in 1937 to a depth of 1608 ft (measured on April 10, 1946 at 1677 ft deep and cleaned out in 1956 to 1609 ft) by C. W. Varner, Dubuque, Iowa. The well is located at the southeast corner of the Washington St. Station at 921 East Washington St., approximately 480 ft S and 1460 ft E of the NW corner of Section 14, T35N, R10E. The land surface elevation at the well is approximately 564 ft.

A sample study log of the Washington St. Well No. 1 furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
QUATERNARY SYSTEM		
Pleistocene Series		
Glacial drift	37	37
SILURIAN SYSTEM		
Niagaran and Alexandrian Series		
Dolomites, water bearing	183	220
ORDOVICIAN SYSTEM		
Maquoketa Group		
Ft. Atkinson Limestone		
Limestone	36	256
Scales Shale		
Shale	74	330
Galena and Platteville Groups		
Dolomite	345	675
Ancell Group		
Glenwood-St. Peter Sandstone		
Sandstone, water bearing	254	929
Shale and lime, caving	53	982
ORDOVICIAN AND CAMBRIAN SYSTEMS		
Oneota, Eminence, Potosi, and Franconia Formations		
Dolomite and sandstone	449	1431
CAMBRIAN SYSTEM		
Ironton-Galesville Sandstone		
Sandstone, water bearing	116	1547
Eau Claire Formation		
Shale and dolomite	61	1608

A 23-in. diameter hole was drilled to a depth of 350 ft, reduced to 15 in. between 350 and 980 ft, reduced to 12 in. between 980 and 1134 ft, and finished 10 in. in diameter from 1134 to 1608 ft. Originally, the well was cased with 24-in. drive pipe from land surface to a depth of 39 ft, 18-in. OD pipe from land surface to a depth of 68.5 ft, 18-in. OD pipe from 239 ft to a depth of 350 ft, 12-in. pipe from 917.5 ft to a depth of 980 ft, and 10-in. pipe from 1076.4 ft to a depth of 1134 ft. In November 1956, the 18-in. casing was removed, the hole was reamed out to 16 in. in diameter from 350 to 380 ft, and a new 16-in. OD casing was installed from land surface to a depth of 358 ft (cemented in). In 1971, the 12- and 10-in. diameter liners were removed and the hole was reamed out to 15.2 in. in diameter from 380 to 1134 ft and 12 in. in diameter from 1134 to 1609 ft. The well was then cased with a 12-in. liner from 915.2 ft to a depth of 1134 ft.

In July 1937, the well reportedly produced 1050 gpm with a drawdown of 125 ft from a nonpumping water level of 270 ft below the top of the casing.

In 1944, when the production dropped off, the pump was pulled and the hole was found bridged at 1192 ft and filled with sand to 1484 ft. The sand was bailed out to 1595 ft, a complete string of tools left in the hole in previous years was removed, and the hole cleaned to its original depth by October 30, 1944.

On October 4, 1946, the nonpumping water level was reported to be 409 ft below the pump base after a 45-min idle period.

From November 1956 through January 1957, the J. P. Miller Artesian Well Co., Brookfield, removed the 18-in. casing and reamed the hole out from 350 to 380 ft. A new liner was installed and a fill of 90 ft of material was cleaned out of the well to a depth of 1609 ft. The well was then shot with 114 lb of nitrogel and 4 lb of 60 percent dynamite between 1544 and 1550 ft. A second shot of 185 lb of 100 percent nitrogel and 10 lb of 60 percent dynamite was exploded between 1527 and 1540 ft. The well was cleaned out to 1609 ft and the nonpumping water level was reported to be 402 ft.

A production test was conducted by the J. P. Miller Artesian Well Co. on February 21, 1957. After 3 hr of pumping at a rate of 1000 gpm, the drawdown was 70 ft from a nonpumping water level of 420 ft.

In March 1962 the pump was pulled and the well was cleaned out.

In 1971, this well was rehabilitated by the J. P. Miller Artesian Well Co. The 12- and 10-in. diameter liners were removed, the hole reamed out, and a new liner installed.

The pumping equipment presently installed consists of a 200-hp 1775 rpm General Electric motor (Model No. 12F5159, Serial No. 6328607), a 12-in., 9-stage Peerless turbine pump (No. 8004) set at 800 ft, rated at 1200 gpm, and has 800 ft of 10-in. column pipe. A 20-ft section of 8-in. suction pipe is attached to the pump intake. The well is equipped with 800 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B052856) is for a water sample from the well collected April 29, 1981, after 24 hr of pumping at 796 gpm.

WASHINGTON ST. WELL NO. 1, LABORATORY NO. B052856

		mg/l	*me/l*			*mg/l*	*me/l*
Iron	Fe	0.28		Silica	SiO_2	7.7	
Manganese	Mn	0.006		Fluoride	F	1.33	0.07
Ammonium	NH_4	0.6	0.03	Boron	B	0.59	
Sodium	Na	63	2.74	Cyanide	CN	<0.005	
Potassium	K	10.8	0.28	Nitrate	NO_3	<0.4	
Calcium	Ca	75	3.74	Chloride	Cl	34	0.96
Magnesium	Mg	22.5	1.85	Sulfate	SO_4	114	2.37
Strontium	Sr	2.66		Alkalinity(as$CaCO_3$)		278	5.56
Arsenic	As	<0.001		Hardness(as$CaCO_3$)		281	5.62
Barium	Ba	0.034					
Beryllium	Be	<0.0005		Total dissolved			
Cadmium	Cd	<0.003		minerals		515	
Chromium	Cr	<0.005					
Cobalt	Co	<0.005					
Copper	Cu	<0.003					
Lead	Pb	0.007					
Mercury	Hg	<0.00005					
Nickel	Ni	0.005					
Selenium	Se	<0.0005					
Silver	Ag	<0.005					
Vanadium	V	<0.004					
Zinc	Zn	0.054		pH (as rec'd)		7.4	

Other wells located throughout the city are listed as follows:

OTTAWA ST. WELL (also known as Well 1D), presently open to the Cambrian-Ordovician aquifer, was completed in September 1907 to a depth of 1621 ft (reported to be 1525 ft in 1944) by L. Wilson & Co., Chicago. The well is located at the southwest corner of Ottawa St. and Crowley Ave., approximately 2425 ft N and 425 ft W of the SE corner of Section 9, T35N, R10E. The land surface elevation at the well is approximately 533 ft.

A sample study log of the Ottawa St. Well furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
QUATERNARY SYSTEM		
Pleistocene Series		
Drift	5	5
SILURIAN SYSTEM		
Niagaran and Alexandrian Series		
Dolomite, water bearing	213	218
ORDOVICIAN SYSTEM		
Maquoketa Group		
Shale	140	358
Galena and Platteville Groups		
Dolomite	360	718
Ancell Group		
Glenwood-St. Peter Sandstone		
Sandstone, water bearing	410	1128
Kress Member		
Shale and marl	59	1187
CAMBRIAN SYSTEM		
Potosi, Franconia, Ironton, and Galesville Formations		
Dolomites and sandstones	409	1596
Eau Claire Formation		
Shale	25	1621

Originally, a 19-in. diameter hole was drilled to a depth of 198 ft, reduced to 10 in. between 198 and 1195 ft, reduced to 8 in. between 1195 and 1288 ft, and finished 7 in. in diameter from 1288 to 1621 ft. The well was cased with 16-in. OD pipe from land surface to a depth of 198 ft, 8-in. liner from 1102 ft to a depth of 1195 ft, and 7-in. liner from 1195 ft to a depth of 1288 ft. In 1937, a 5-in. diameter perforated liner was placed from 1521 ft to a depth of 1621 ft. After rehabilitation in 1944, the well was reported to be 20 in. in diameter from land surface to 200 ft, 15.2 in. between 200 and 615 ft, 12 in. between 615 and 1209 ft, and 10 in. between 1209 and 1525 ft. The casing consisted of 16-in. OD pipe from about 0.2 ft above the pump station floor to a depth of 200 ft and a 10-in. ID liner from 1088 ft to a depth of 1209 ft. The top of the 5-in. perforated liner was in bad condition at a depth of 1525 ft but was not removed. In 1953, the 16-in. casing was removed and a new 12-in. pipe was installed from about 0.2 ft above the pump station floor to a depth of 303 ft (cemented in).

When originally completed in 1907, the well was left open to the base of the Silurian dolomite, the Maquoketa Group, and the Cambrian-Ordovician aquifer. The nonpumping water level was reported to be 8 ft below land surface in September 1907.

In July 1913, after pumping at a rate of 700 gpm, the drawdown was 82 ft from a nonpumping water level of 58 ft.

In 1923, the nonpumping water level was reported to be 180 ft.

In 1932, this well was shot with nitroglycerin and cleaned by J. O. Heflin, Joliet. The nonpumping water level was reported to be 246 ft after shooting.

In October 1933, the nonpumping water level was reported to be 264 ft.

In 1937, C. W. Varner, Dubuque, Iowa, cleaned the well, did some further shooting, and placed 100 ft of 5-in. perforated pipe at the bottom of the well.

On April 21, 1937, after 4 hr of pumping at rates ranging from 650 to 840 gpm, the final drawdown was 87 ft from a nonpumping water level of 236 ft.

In December 1938, the well reportedly produced 800 gpm with a drawdown of 93 ft from a nonpumping water level of 236 ft.

In 1944, this well was rehabilitated and reamed out by the J. P. Miller Artesian Well Co., Brookfield.

On March 9, 1945, after pumping at rates of 1100 to 1000 gpm, the drawdown was 92 ft from a nonpumping water level of 338 ft below the pump base.

Nonpumping water levels were reported to be 381 ft below the pump base after a 45-min idle period on October 4, 1946, and 362 ft on June 6, 1953.

During rehabilitation work in October 1953, the Silurian dolomite and Maquoketa Group were sealed from the hole leaving the well open to the Cambrian-Ordovician aquifer.

On August 19, 1959, the nonpumping water level was reported to be 414 ft.

In March 1974, the well reportedly produced 1025 gpm for 22 hr with a drawdown of 55 ft from a nonpumping water level of 605 ft below land surface.

The pumping equipment presently installed consists of a 200-hp General Electric motor, a 12-in. Peerless turbine pump set at 710 ft, rated at 1000 gpm, and has 710 ft of 8-in. column pipe. A 10-ft section of 8-in. suction pipe is attached to the pump intake. The well is equipped with 710 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. C003737) of a sample collected April 2, 1979, after pumping for 24 hr, showed the water to have a hardness of 263 mg/l, total dissolved minerals of 564 mg/l, and an iron content of 0.3 mg/l. Hydrogen sulfide was apparent when a previous sample was collected.

CANAL ST. WELL, open to the Cambrian-Ordovician aquifer except for the Galena-Platteville dolomite and the Glenwood-St. Peter Sandstone, was completed in 1911 to a depth of 1575 ft by the Ohio Drilling Co., Massillon, Ohio. This well was abandoned in 1931 and sealed prior to 1948. The well was located at the corner of Canal and Division Sts. near the west bank of the Des Plaines River, approximately 2640 ft S and 1125 ft W of the NE corner of Section 9, T35N, R10E. The land surface elevation at the well is approximately 532 ft.

A sample study log of the Canal St. Well furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
QUATERNARY SYSTEM		
Pleistocene Series		
Glacial drift	3	3
SILURIAN SYSTEM		
Niagaran and Alexandrian Series		
Dolomites, water bearing	212	215
ORDOVICIAN SYSTEM		
Maquoketa Group		
Ft. Atkinson Limestone		
Dolomite	10	225
Scales Shale		
Shale, some dolomite	70	295
Galena and Platteville Groups		
Dolomite	325	620
Ancell Group		
Glenwood-St. Peter Sandstone		
Sandstone, water bearing	200	820
Canadian Group		
Shakopee-Oneota Dolomite	225	1045
CAMBRIAN SYSTEM		
Eminence Dolomite		
Sandy dolomite	30	1075
Potosi Dolomite	165	1240
Franconia Formation		
Sandstone and dolomite	90	1330
Ironton-Galesville Sandstone		
Sandstone, water bearing	185	1515
Eau Claire Formation		
Sandstone and dolomite	55	1570

A 14-in. diameter hole was drilled to a depth of 318 ft, reduced to 11 in. between 318 and 893 ft, and finished 10.6 in. in diameter from 893 to 1575 ft. The well was cased with 14-in. pipe to a depth of 318 ft and 10.6-in. pipe from land surface to a depth of 893 ft (cemented in).

In 1922, the well reportedly produced 292 gpm with a drawdown of 129 ft from a nonpumping water level of 160 ft below the top of the well.

On October 5, 1933, the nonpumping water level was reported to be 187.2 ft below the pump station floor.

A mineral analysis of a sample (Lab. No. 68217) collected December 17, 1930, showed the water to have a hardness of 183 mg/l, total dissolved minerals of 550 mg/l, and an iron content of 0 mg/l.

SPRUCE SLIP WELL (also known as Well 2D), open to the Cambrian-Ordovician aquifer, was completed in 1912 to a depth of 1565 ft (cleaned out to 1535 ft in 1948 and to 1556 ft in 1958) by the Ohio Drilling Co., Massillon, Ohio. (3) The well is located on Spruce Slip St. just east of South Chicago St., approximately 2100 ft S and 255 ft E of the NW corner of Section 15, T35N, R10E. The land surface elevation at the well is approximately 529 ft.

A sample study log of the Spruce Slip Well furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
SILURIAN SYSTEM		
Niagaran and Alexandrian Series		
Dolomites	200	200
ORDOVICIAN SYSTEM		
Maquoketa Group		
Dolomite and shale	80	280
Galena and Platteville Groups		
Dolomite	330	610
Ancell Group		
Glenwood-St. Peter Sandstone		
Sandstone, water bearing	230	840
ORDOVICIAN AND CAMBRIAN SYSTEMS		
Oneota, Eminence, and Potosi Dolomites	395	1235
CAMBRIAN SYSTEM		
Franconia Formation		
Sandstone and dolomite	105	1340
Ironton-Galesville Sandstone		
Sandstone, water bearing	180	1520
Eau Claire Formation	10	1530

A 16-in. diameter hole was drilled from 35 ft to a depth of 320 ft, reduced to 13 in. between 320 and 882 ft, and finished 10 in. in diameter from 882 to 1565 ft. Originally, the well was cased with 14-in. pipe from about 1 ft above the wellhouse floor to a depth of 320 ft. In 1948, the casing was removed and an 18-in. OD surface pipe was placed from land surface to a depth of 35 ft, 14-in. pipe from land surface to a depth of 326 ft (cemented in), and a 10-in. liner from 717.5 ft to a depth of 882 ft.

Upon completion, the well reportedly produced 400 gpm with a drawdown of 106 ft from a nonpumping water level of 36 ft below land surface.

In 1922, after pumping at a rate of 184 gpm, the drawdown was 334.0 ft from a nonpumping water level of 142.6 ft.

From January to May 1948, the J. P. Miller Artesian Well Co., Brookfield, shot this well with 200 lb blasting gelatin but no sand was released. Further shooting consisted of 300 lb of gel at 1490 ft, 356 lb of gel at 1470 ft, and 400 lb of nitrogel between 1416 and 1438 ft. New casings and liner were installed.

A production test was conducted by the J. P. Miller Artesian Well Co. on May 25-26, 1948. After 28.5 hr of pumping at rates ranging from 250 to 500 gpm, the maximum drawdown was 180 ft from a nonpumping water level of 320 ft.

A production test was conducted by the J. P. Miller Artesian Well Co. on July 3, 1950. After 6.5 hr of pumping at rates of 805 to 791 gpm, the final drawdown was 210 ft from a nonpumping water level of 368 ft. Forty min after pumping was stopped, the water level had recovered to 386 ft.

Nonpumping water levels were reported to be 383 ft in June 1951 and 388 ft on January 20, 1958.

From January to April 1958, this well was rehabilitated. The well had filled in to 1470 ft, presumably from an earlier shooting. About 19 cubic yards of material was cleaned out to a depth of 1556 ft.

This well was rehabilitated and cleaned in July 1962 and 1973.

The pumping equipment presently installed consists of a 200-hp 1775 rpm General Electric motor (Model No. 12F5983, Serial No. WD6781582), a 15-stage Peerless turbine pump (Serial No. 50439) set at 960 ft, rated at 1000 gpm, and has 960 ft of 8-in. column pipe. The well is equipped with 960 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. C003733) of a sample collected April 2, 1979, after pumping for 24 hr at 300 gpm, showed the water to have a hardness of 255 mg/l, total dissolved minerals of 594 mg/l, and an iron content of 0.1 mg/l.

VAN BUREN ST. WELL, open to the Cambrian-Ordovician aquifer, was completed in 1913 to a depth of 1547.5 ft by the Ohio Drilling Co., Massillon, Ohio. This well was abandoned in 1941 and sealed about 1955. The well was located on Van Buren St. west of Eastern Ave., approximately 780 ft N and 1400 ft E of the SW corner of Section 10, T35N, R10E. The land surface elevation at the well is approximately 538 ft.

A sample study log of the Van Buren St. Well furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
No record	330	330
ORDOVICIAN SYSTEM		
Galena and Platteville Groups		
Dolomite	290	620
Ancell Group		
Glenwood-St. Peter Sandstone		
Sandstone, water bearing	300	920
Strata (continued)	*Thickness (ft)*	*Depth (ft)*
Prairie du Chien Group		
Oneota Dolomite	100	1020
Gunter Sandstone	30	1050
CAMBRIAN SYSTEM		
Eminence-Potosi Dolomite	170	1220
Franconia Formation		
Dolomite and sandstone	140	1360
Ironton-Galesville Sandstone	160	1520
Eau Claire Formation		
Sandstone and shale	30	1550

A 14-in. diameter hole was drilled to a depth of 328 ft, reduced to 10 in. between 328 and 965 ft, reduced to 9.6 in. between 965 and 1430 ft, and finished 7.6 in. in diameter from 1430 to 1547.5 ft. The well was cased with 14-in. pipe from 1 ft above land surface to a depth of 328 ft and 10-in. liner from 800 ft to a depth of 900 ft.

Upon completion, after pumping at a rate of 450 gpm, the drawdown was 177 ft from a nonpumping water level of 63 ft below land surface.

In 1922, the well reportedly produced 485 gpm with a drawdown of 229.5 ft from a nonpumping water level of 188.5 ft.

On October 5, 1933, the nonpumping water level was reported to be 223.5 ft below land surface.

A mineral analysis of a sample (Lab. No. 68213) collected December 17, 1930, showed the water to have a hardness of 233 mg/l, total dissolved minerals of 567 mg/l, and an iron content of 0 mg/l.

DES PLAINES ST. WELL, open to the Cambrian-Ordovician aquifer, was completed in 1913 to a depth of 1575 ft by the Ohio Drilling Co., Massillon, Ohio. This well is presently in use only as an observation well by the State Water Survey. The well is located west of Des Plaines St. near Lafayette St. and the east bank of the Des Plaines River, approximately 360 ft S and 1240 ft W of the NE corner of Section 16, T35N, R10E. The land surface elevation at the well is approximately 531 ft.

A sample study log of the Des Plaines St. Well furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
SILURIAN SYSTEM		
Niagaran and Alexandrian Series		
Dolomite and limestone	190	190
ORDOVICIAN SYSTEM		
Maquoketa Group		
Ft. Atkinson Limestone		
Dolomite	10	200
Scales Shale	80	280
Galena Group		
Dolomite	190	470
Platteville Group		
Dolomite and limestone	125	595
Ancell Group		
Glenwood-St. Peter Sandstone		
Sandstone, incoherent	485	1080
Shale and chert, caving	20	1100

Strata (continued)	Thickness (ft)	Depth (ft)
CAMBRIAN SYSTEM		
Potosi Dolomite	150	1250
Franconia Formation		
Sandy limestone and sandstone	150	1400
Ironton-Galesville Sandstone		
Sandstone, water bearing	160	1560

The well is reportedly cased with 14-in. pipe from 2.5 ft above land surface to a depth of 300 ft, 7-in. liner from 600 ft to a depth of 824 ft, and 5.9-in. liner from 1200 ft to a depth of 1300 ft.

Upon completion, after pumping at a rate of 450 gpm, the drawdown was 116 ft from a nonpumping water level of 64 ft below land surface.

In 1922, the well reportedly produced 305 gpm with a drawdown of 89 ft from a nonpumping water level of 189 ft.

Nonpumping water levels were reported to be 222 ft below land surface on October 4, 1933, and 219 ft below the top of the casing on July 21, 1941.

Monthly measurements of the nonpumping water level during the period July 1942 to March 1981 ranged from about 259 to 618 ft below land surface.

A mineral analysis of a sample (Lab. No. 68218) collected December 17, 1930, showed the water to have a hardness of 246 mg/l, total dissolved minerals of 532 mg/l, and an iron content of 0 mg/l.

RUBY ST. WELL, open to the Cambrian-Ordovician aquifer except for the Galena-Platteville dolomite and the Glenwood-St. Peter Sandstone, was completed in 1915 to a depth of 1564 ft (reported to be 1565 ft in 1931, sounded in 1940 at 1544 ft, and rehabilitated in 1944-1945 to a depth of 1568 ft) by the Ohio Drilling Co., Massillon, Ohio. **This well was abandoned in 1951 and sealed in 1956.** The well was located just south of the Ruby St. bridge on the west bank of the Des Plaines River, approximately 565 ft S and 470 ft W of the NE corner of Section 9, T35N, R10E. The land surface elevation at the well is approximately 546 ft.

A sample study log of the Ruby St. Well furnished by the State Geological Survey follows:

Strata	Thickness (ft)	Depth (ft)
SILURIAN SYSTEM		
Niagaran and Alexandrian Series		
Dolomite, water bearing	180	180
ORDOVICIAN SYSTEM		
Maquoketa Group		
Scales Shale	80	260
Galena and Platteville Groups		
Dolomite	340	600
Ancell Group		
Glenwood-St. Peter Sandstone	390	990
Prairie du Chien Group		
Oneota Dolomite	20	1010
Gunter Sandstone	10	1020
CABRIAN SYSTEM		
Eminence-Potosi Dolomite	210	1230
Franconia Formation		
Dolomite and sandstone	120	1350
Ironton-Galesville Sandstone		
Sandstone, water bearing	130	1480
Eau Claire Formation		
Dolomite and shale	80	1560

Originally, a 14-in. diameter hole was drilled to a depth of 303 ft, reduced to 12 in. between 303 and 1019 ft, and finished 10 in. in diameter from 1019 to 1564 ft. The well was cased with 14-in. pipe to a depth of 303 ft. In 1931, when the well was repaired, the hole was reported to be 17 in. in diameter from land surface to a depth of 303 ft, 13 in. between 303 and 1170 ft, and 10 in. between 1170 and 1565 ft. The well was cased with 12-in. pipe to a depth of 410 ft, 10-in. pipe from 410 ft to a depth of 1237.5 ft, and an 8-in. perforated pipe from 1237.5 ft to a depth of 1438 ft. After rehabilitation in 1944-1945, the hole was reported to be 18 in. in diameter from 0 to 440 ft, 12 in. from 440 to 1237 ft, and 10 in. from 1237 to 1568 ft. The well was then cased with 14-in. pipe from land surface to a depth of 440 ft, 12-in. standard pipe from land surface to a depth of 437 ft, 10-in. pipe from 437 ft to a depth of 1237 ft, and an 8-in. perforated pipe from 1237 ft to a depth of 1438 ft.

In 1922, the well reportedly produced 532 gpm with a drawdown of 188 ft from a nonpumping water level of 185 ft.

After repairing in 1931 by the S. B. Geiger & Co., Chicago, the depth was reported to be 1565 ft. The old casing was removed and new casings and a liner were installed.

On October 5, 1933, the nonpumping water level was reported to be 210 ft below land surface.

On January 4, 1940, the J. P. Miller Artesian Well Co., Brookfield, sounded this well and the depth was reported to be 1544 ft and the nonpumping water level was 228 ft below the pump base.

This well was rehabilitated in 1944-1945 by the J. P. Miller Artesian Well Co. The old casing was removed, the hole reamed out, and new casings installed.

On February 19, 1945, the well reportedly produced 680 gpm with the pumping level below the 458-ft airline from a nonpumping water level of 348 ft below the pump base.

On October 4, 1946, the well reportedly produced 600 gpm with the pumping level below the 458-ft airline. After pumping was stopped for 45 min, the water level had recovered to 398 ft below the pump base.

In September 1951, the nonpumping water level was reported to be 434 ft.

A mineral analysis of a sample (Lab. No. 108174) collected October 31, 1946, after pumping for 20 min at 600 gpm, showed the water to have a hardness of 263 mg/l, total dissolved minerals of 475 mg/l, and an iron content of 0.5 mg/l.

JASPER ST. WELL (also known as Well 3D), open to the Cambrian-Ordovician aquifer, was completed in 1924 to a depth of 1565 ft (reported to be 1558 ft in 1933 and cleaned out to 1536 ft in 1947) by William H. Cater, Chicago. The well is located at 325 Jasper St. just off Center St. near the west bank of the Des Plaines River, approximately 1850 ft N and 2630 ft E of the SW corner of Section 16, T35N, R10E. The land surface elevation at the well is approximately 537 ft. (5)

A sample study log of the Jasper St. Well furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
SILURIAN SYSTEM		
Niagaran Series		
Joliet Dolomite	50	50
Alexandrian Series		
Kankakee Dolomite	30	80
Elwood Dolomite	20	100
Wilhelmi Formation	70	170
ORDOVICIAN SYSTEM		
Maquoketa Group		
Ft. Atkinson Limestone	20	190
Scales Shale	80	270
Galena Group	200	470
Platteville Group	125	595
Ancell Group		
Glenwood Formation		
Dolomite and sandstone	20	615
St. Peter Sandstone, water bearing	175	790
Prairie du Chien Group		
Shakopee Dolomite	55	845
Oneota Dolomite	205	1050
CAMBRIAN SYSTEM		
Eminence-Potosi Dolomite	185	1235
Franconia Formation		
Dolomite and sandstone	140	1375
Ironton-Galesville Sandstone		
Sandstone, water bearing	165	1540
Eau Claire Formation		
Shale and sandstone	25	1565

A 21-in. diameter hole was drilled to a depth of 303 ft and finished 15 in. in diameter from 303 to 1565 ft. The well is cased with 17-in. OD pipe from about 0.4 ft above the wellhouse floor to a depth of 303 ft (cemented in).

Upon completion, the well reportedly produced 1250 gpm with a drawdown of 100 ft from a nonpumping water level of 165 ft.

In 1927, the driller sealed in the 17-in. pipe with cement grout, and the nonpumping water level was reported to be 165 ft.

In 1933, the Layne-North Central Co., Chicago, shot the well with 4 charges of nitroglycerin (25 qt each) at depths of 1207, 1321, 1435, and 1549 ft. The depth was reported to be 1558 ft after shooting.

On August 24, 1933, the nonpumping water level was reported to be 165 ft below land surface.

In 1937, this well was cleaned out and the pump repaired.

On September 8, 1938, the well reportedly produced 940 gpm with a drawdown of 166 ft from a nonpumping water level of 261 ft.

Nonpumping water levels were reported to be 259 ft below the pump base on July 25, 1941, and 306 ft on March 7, 1947.

On March 18, 1947, the J. P. Miller Artesian Well Co., Brookfield, shot the well with 500 lb of nitrogel at a depth of 1530 ft. On April 9, 1947, a second shot of 500 lb of nitrogel was exploded at a depth of 1492 ft. A carload of sand was removed and the well cleaned out to 1536 ft.

In October 1952, after the pump shaft was found to be broken, the J. P. Miller Artesian Well Co. shot the well with 228 lb of 100 percent nitrogel and 5 lb of 60 percent primer between the depths of 1530 and 1540 ft. After the well was cleaned out to 1560 ft, the nonpumping water level was reported to be 342 ft on January 15, 1953. The pump was repaired and reinstalled.

In June 1961, this well was cleaned and the pump was lowered.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 54925) rated at 1000 gpm, and powered by a 250-hp 1800 rpm U. S. electric motor (Serial No. 1078963). The well is equipped with 768 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. C003738) of a sample collected April 2, 1979, after pumping for 24 hr at 850 gpm, showed the water to have a hardness of 255 mg/l, total dissolved minerals of 510 mg/l, and an iron content of 0.2 mg/l.

WILLIAMSON AVE. WELL (also known as Well 4D), open to the Cambrian-Ordovician aquifer, was completed in 1924 to a depth of 1608 ft (reported to be 1613 ft in 1929, drilled and bailed out to 1609 ft in 1945, and cleaned out to 1575 ft in 1957) by the Sewell Well Co., St. Louis, Mo. The well is located at 806 Williamson Ave. near Charlesworth Ave., approximately 1250 ft N and 180 ft E of the SW corner of Section 2, T35N, R10E. The land surface elevation at the well is approximately 558 ft. (6)

A sample study log of the Williamson Ave. Well furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
QUATERNARY SYSTEM		
Pleistocene Series		
Glacial drift	15	15
SILURIAN SYSTEM		
Niagaran Series	85	100
Alexandrian Series		
Kankakee Dolomite	30	130
Elwood Dolomite	25	155
Wilhelmi Formation	50	205
ORDOVICIAN SYSTEM		
Maquoketa Group		
Ft. Atkinson Limestone		
Dolomite	30	235
Scales Shale	80	315
Galena Group		
Dolomite	205	520

Strata	Thickness (ft)	Depth (ft)
Platteville Group		
Dolomite	130	650
Ancell Group		
Glenwood-St. Peter Sandstone		
Sandstone, water bearing	495	1145
Shale and chert	25	1170
CAMBRIAN SYSTEM		
Potosi Dolomite	60	1230
Franconia Formation		
Sandstone and dolomite	115	1345
Ironton-Galesville Sandstone		
Sandstone, water bearing	185	1530
Eau Claire Formation		
Sandstone and shale	78	1608

Originally, a 19-in. diameter hole was drilled to a depth of 346 ft, reduced to 17 in. between 346 and 1161 ft, and finished 12 in. in diameter from 1161 to 1608 ft. The well was cased with 16-in. pipe from land surface to a depth of 346 ft and a 13-in. liner from 1101 ft to a depth of 1161 ft. In 1929 after shooting, the well was reported to be cased with 20-in. ID pipe from land surface to a depth of 20 ft, 15.2-in. pipe from land surface to a depth of 391 ft (cemented in), 8-in. liner from 1260 ft to a depth of 1613 ft (from 1408 to 1568 ft the liner was perforated). After rehabilitation in 1945, the well was reported to be 19.2 in. in diameter from 0 to 386 ft, 15.2 in. between 386 and 1170 ft, and 12 in. between 1170 and 1609 ft. The casing consists of 20-in. OD pipe from land surface to a depth of 20 ft, 16-in. OD pipe from land surface to a depth of 386 ft, 13-in. OD liner from 1108.5 ft to a depth of 1170 ft, and 10-in. ID liner from 1170 ft to a depth of 1414.8 ft. In 1957, the old liners were removed and a new 16-in. OD pipe was installed from land surface to a depth of 367 ft (cemented in) and a 13-in. OD liner was placed from 1105 ft to a depth of 1170 ft.

In March 1927, after pumping at a rate of 765 gpm, the drawdown was 100 ft from a nonpumping water level of 195 ft.

In 1929, the S. B. Geiger & Co., Chicago, shot this well with 1500 lb of dynamite at a depth of about 1550 ft. The well was cleaned and the depth was reported to be 1613 ft. New casing was also installed during this rehabilitation.

In September 1938, the well reportedly produced 960 gpm with a pumping water level below 400 ft from a nonpumping water level of 209 ft.

From April 24 to November 29, 1945, this well was rehabilitated by the J. P. Miller Artesian Well Co., Brookfield. The well was shot in the Galesville Sandstone at depths of 1525, 1514, 1500, 1489, and 1458 ft. After shooting, the well was drilled and bailed out to 1609 ft.

A production test was conducted by the State Water Survey on February 15, 1946. After 9.8 hr of pumping at rates ranging from 1005 to 825 gpm, the pumping water level was 453 ft below the pump base. Fourteen hr after pumping was stopped, the water level had recovered to 348 ft.

Nonpumping water levels were reported to be 410 ft below the pump base after an idle period of 36 min on October 4, 1946, and 452 ft in September 1951.

In February 1957, the J. P. Miller Artesian Well Co. removed the old liners and installed a new 16-in. casing and a 13-in. liner. The well was then shot at five levels as follows: 228 lb of nitrogel and 8 lb of dynamite between 1515 and 1525 ft, 228 lb of nitrogel and 8 lb of dynamite between 1495 and 1505 ft, 285 lb of nitrogel and 8 lb of dynamite between 1475 and 1485 ft, 242 lb of nitrogel and 12 lb of dynamite between 1557 and 1570 ft, and 228 lb of nitrogel and 8 lb of dynamite between 1525 and 1535 ft. The well was cleaned out to 1575 ft and the nonpumping water level was reported to be 438 ft.

On February 16, 1958, the nonpumping water level was reported to be 422 ft and the well was placed back in operation.

On October 8, 1980, the nonpumping water level was reported to be 677 ft.

The pumping equipment presently installed consists of a 200-hp 1775 rpm General Electric motor (Serial No. 6328604), a 12-in., 10-stage Peerless turbine pump (No. 31940) set at 860 ft, rated at 1000 gpm at about 463 ft head, and has 860 ft of 10-in. column pipe. The well is equipped with 860 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B052860) of a sample collected April 29, 1981, after pumping for 24 hr at 934 gpm, showed the water to have a hardness of 253 mg/l, total dissolved minerals of 491 mg/l, and an iron content of 0.21 mg/l.

CAMPBELL ST. WELL (also known as Well 9D), open to the Cambrian-Ordovician aquifer, was completed in August 1964 to a depth of 1671 ft (cleaned out to 1600 ft in 1965) by the J. P. Miller Artesian Well Co., Brookfield. The well is located at 1919 Campbell St. on the west side of the city, approximately 1200 ft N and 2450 ft W of the SE corner of Section 7, T35N, R10E. The land surface elevation at the well is approximately 647 ft.

A drillers log of the Campbell St. Well follows:

Strata	Thickness (ft)	Depth (ft)
Drift	60	60
Light lime hard	5	65
Lime changing gray	10	75
Dark gray lime, hard	35	110
Lime light gray	20	130
Lime changing to light brown	20	150
Gray lime	40	190
Gray lime, medium	10	200
Gray shaly lime	30	230
Shale and dark lime	10	240
Gray shaly lime	40	280
Squeeze	5	285
Lime streak	5	290
Gray shale (water at 75 ft)	20	310
Dark brown shale	53	363
Brown lime, medium	117	480
Light brown lime, medium	80	560
Brown lime	30	590
Dark green lime	14	604

Strata (continued)	Thickness (ft)	Depth (ft)
Brown lime, hard	16	620
Hard brown lime	20	640
Light brown lime	15	655
Brown lime	45	700
Sandy lime	4	704
St. Peter sand	271	975
Medium hard sand	8	983
Soft sand	47	1030
Hard brown sand	9	1039
Shale, blue	5	1044
Hard lime shells	5	1049
Green shale	46	1095
Sandy lime and shale	15	1110
Shaly lime	5	1115
Lime and shale	15	1130
White lime	20	1150
Gray sand hard sharp	5	1155
Gray sand lime streaks	10	1165
Lime and shale breaks	35	1200
Shale, sand and lime	10	1210
Shale, lime shells	10	1220
Broken lime	30	1250
Light gray lime hard	50	1300
Green lime shaly	25	1325
Green shaly lime	50	1375
Gray lime	25	1400
Light brown lime	25	1425
Light brown sandy lime hard	23	1448
Sand light brown	2	1450
White sand	40	1490
Medium white sand	10	1500
Soft sand	46	1546
Hard sand	4	1550
Medium sand	25	1575
Hard sand	20	1595
Medium sand	18	1613
Black lime hard	11	1624
Green lime and shale	2	1626
Green and blue shale, tough	24	1650
Gray shaly lime	21	1671

A 25-in. diameter hole was drilled to a depth of 404 ft, reduced to 19 in. between 404 and 1103 ft, reduced to 17 in. between 1103 and 1256 ft, and finished 13.2 in. in diameter from 1256 to 1671 ft. The well is cased with 26-in. drive pipe from land surface to a depth of 63.5 ft, 20-in. pipe from land surface to a depth of 401 ft (cemented in), 18-in. liner from 1006 ft to a depth of 1103 ft, and 16-in. liner from 1134 ft to a depth of 1256 ft.

The well was shot at seven levels as follows: 206 lb from 1602 to 1608 ft, 408 lb from 1583 to 1595 ft, 408 lb from 1566 to 1578 ft, 408 lb from 1548 to 1560 ft, 408 lb from 1530 to 1542 ft, 409 lb from 1510 to 1522 ft, and 610 lb from 1553 to 1570 ft.

A production test was conducted by the driller on August 31-September 1, 1964. After 25 hr of pumping at a rate of 1059 gpm, the drawdown was 176 ft from a nonpumping water level of 487 ft below land surface. After testing, the well was shot with 100 lb of dynamite.

A second production test was conducted on November 2-3, 1964, by representatives of the driller and Casler & Associates, Consulting Engineers. After 4.8 hr of pumping at rates of 600 to 812 gpm, the drawdown was 111 ft from a nonpumping water level of 501 ft below land surface. Pumping was continued for 16.6 hr at rates ranging from 1001 to 968 gpm with a drawdown of 144 ft. After an additional 3.4 hr of pumping at rates ranging from 728 to 1319 gpm, the maximum drawdown was about 157 ft. After pumping was stopped for 3.8 hr, the water level had recovered to 548 ft.

In December 1964, the well reportedly produced 1000 gpm for 8 hr with a drawdown of 124 ft from a nonpumping water level of 532 ft below land surface.

After the well was cleaned out in 1965 to a depth of 1600 ft, a production test was conducted by the Wehling Well Works, Beecher, on December 16-21, 1965. After 122.5 hr of pumping at rates ranging from 1746 to 1416 gpm, the final drawdown was 193 ft from a nonpumping water level of 549 ft below land surface.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 252089) set at 915 ft, operated at 1210 gpm, and powered by a 600-hp 1780 rpm U. S. Hollo-shaft electric motor. The well is equipped with 915 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B42693) of a sample collected April 22, 1977, after pumping for 24 hr at 1120 gpm, showed the water to have a hardness of 207 mg/l, total dissolved minerals of 485 mg/l, and an iron content of 0.3 mg/l. Hydrogen sulfide was apparent when previous samples were collected.

ESSINGTON ROAD WELL (also known as Well 10D), open to the Cambrian-Ordovician aquifer, was completed in 1970 to a depth of 1572 ft by the J. P. Miller Artesian Well Co., Brookfield. The well is located west of Essington Road, south of Twin Oaks Drive, approximately 700 ft N and 454 ft W of the SE corner of Section 11, T35N, R9E. The land surface elevation at the well is approximately 610 ft.

A drillers log of the Essington Road Well follows:

Strata	Thickness (ft)	Depth (ft)
Sand and gravel	40	40
Dolomite	170	210
Dolomite and shale	10	220
Shale, some dolomite	20	240
Shale	70	310
Limestone	325	635
Sandstone	145	780
Limestone and shale	80	860
Limestone	375	1235
Limestone and shale	45	1280
Sandstone	20	1300
Limestone	30	1330
Limestone and shale	20	1350
Limestone	40	1390
Sandstone	140	1530
Limestone and shale	42	1572

A 30-in. diameter hole was drilled to a depth of 43 ft, reduced to 25.5 in. between 43 and 380 ft, reduced to 19.2 in. between 380 and 860 ft, and finished 15.2 in. in diameter from 860 to 1572 ft. The well is cased with 30-in. pipe from land surface to a depth of 43 ft, 26-in. pipe from land surface to a depth of 59 ft, 20-in. pipe from land surface to a depth of 363 ft (cemented in), and 16-in. liner from 760 ft to a depth of 860 ft.

The well was shot at eight levels as follows: 200 lb from 1510 to 1520 ft, 250 lb from 1493 to 1505 ft, 250 lb from 1471 to 1483 ft, 250 lb from 1449 to 1461 ft, 250 lb from 1429 to 1441 ft, 250 lb from 1503 to 1515 ft, 250 lb from 1483 to 1493 ft, and 300 lb from 1458 to 1471 ft.

A production test was conducted by the driller on June 12, 1970. After 4.2 hr of pumping at rates ranging from 490 to 800 gpm, the drawdown was 122 ft from a nonpumping water level of 510 ft below the top of the casing.

A second production test was conducted by the driller on June 15, 1970. After 16 hr of pumping at rates ranging from 500 to 1300 gpm, the final drawdown was 202 ft from a nonpumping water level of 510 ft below the top of the casing.

The pumping equipment presently installed is a Peerless turbine pump set at 850 ft, rated at 1200 gpm at about 960 ft TDH, and powered by a 500-hp Ideal electric motor. The well is equipped with 850 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. C003736) is for a water sample from the well collected April 2, 1979, after pumping for 24 hr at 1300 gpm.

ESSINGTON ROAD WELL, LABORATORY NO. C003736

		mg/l	*me/l*			*mg/l*	*me/l*
Iron	Fe	0.8		Silica	SiO_2	8	
Manganese	Mn	0.00		Fluoride	F	1.3	0.07
Ammonium	NH_4	1.4	0.08	Boron	B	0.7	
Sodium	Na	60	2.61	Cyanide	CN	0.01	
Potassium	K	20.2	0.52	Nitrate	NO_3	27.4	0.44
Calcium	Ca	60	2.99	Chloride	Cl	29	0.82
Magnesium	Mg	22	1.81	Sulfate	SO_4	87	1.81
				Alkalinity (as $CaCO_3$)		260	5.20
Arsenic	As	0.000		Hardness (as $CaCO_3$)		242	4.84
Barium	Ba	<0.1					
Cadmium	Cd	<0.01		Total dissolved			
Chromium	Cr	<0.02		minerals		484	
Copper	Cu	<0.02					
Lead	Pb	<0.01					
Mercury	Hg	0.0000					
Nickel	Ni	<0.1					
Selenium	Se	0.00					
Silver	Ag	<0.02					
Zinc	Zn	0.04		pH (as rec'd)		8.0	

ROONEY SITE WELL (also known as Well 11D), open to the Cambrian-Ordovician aquifer except for the Galena-Platteville dolomite and the Glenwood-St. Peter Sandstone, was completed in December 1975 to a depth of 1623 ft by the Wehling Well Works, Beecher. This well was not in use during 1980. The well is located about 75 ft north and 145 ft west of the intersection of Ingalls Ave. and Gaylord Road, approximately 2540 ft S and 1495 ft W of the NE corner of Section 1, T35N, R9E. The land surface elevation at the well is approximately 619 ft.

A drillers log of the Rooney Site Well follows:

Strata	*Thickness (ft)*	*Depth (ft)*
Drift	18	18
Lime	57	75
White lime	35	110
Gray lime	10	120
Gray and brown lime	15	135
Lime	105	240
Lime dark gray with shale	15	255
Shale dark gray	15	270
White lime with shale	5	275
Dark gray shale	90	365
Lime	70	435
Brown lime	85	520
Lime	85	605
Brown lime	55	660
Brown and white lime with sand	35	695
Sand	25	720
St. Peter sand	40	760
Sand, shale "Gumbo"	20	780
Sand shale	20	800
Sand	55	855
White lime with sand and shale	50	905
Brown lime with sand and shale	30	935
Sand with shale and lime	50	985
Lime with sand	40	1025
Lime	270	1295
Lime, sand and shale	172	1467
Sand with some lime	23	1490
Sand	90	1580
Shale	10	1590
Shale with lime and sand	33	1623

A 20-in. diameter hole was drilled to a depth of 22 ft, reduced to 19 in. between 22 and 1014 ft, and finished 15 in. in diameter from 1014 to 1623 ft. The well is cased with 20-in. black steel pipe from land surface to a depth of 22 ft and 16-in. black steel pipe from land surface to a depth of 1014 ft (cemented in).

This well was shot with 560 qt of nitrogel in 7 shots plus 320 qt of nitrogel in 3 shots between the depths of 1515 and 1572 ft. A production test was then conducted by the driller on March 25-26, 1976. After 24 hr of pumping at rates ranging from 1057 to 416 gpm, the drawdown was 144 ft from a nonpumping water level of 640 ft. After this test, this well was shot again with 1100 lb of explosives between 1440 and 1480 ft and with 300 lb of explosives between 1532 and 1542 ft.

A second production test was conducted by the driller on August 2-3, 1976. After 23.5 hr of pumping at rates ranging from 810 to 1193 gpm, the final drawdown was 157 ft from a nonpumping water level of 647 ft below land surface.

The pumping equipment presently installed is a Johnston turbine pump set at 950 ft, rated at 1000 gpm, and powered by a 500-hp electric motor.

A partial analysis of a sample (Lab. No. 201597) collected during the initial production test, showed the water to have a hardness of 222 mg/l, total dissolved minerals of 470 mg/l, and an iron content of 0.5 mg/l.

HOMART SITE WELL (also known as Well 12D), open to the Cambrian-Ordovician aquifer except for the Galena-Platteville dolomite and the Glenwood-St. Peter Sandstone, was completed in October 1975 to a depth of 1557 ft by the Wehling Well Works, Beecher. This well was not in use during 1980. The well is located about 350 ft south and 80 ft east of the intersection of Central Drive and Glosgow St., approximately 2415 ft N and 1415 ft E of the SW corner of Section 25, T36N, R9E. The land surface elevation at the well is approximately 602 ft.

A drillers log of the Homart Site Well follows:

Strata	*Thickness (ft)*	*Depth (ft)*
Drift	25	25
Lime	80	105
Lime with green shale	20	125
Lime	111	236
Lime with shale	9	245
Shale	80	325
Shale with lime	5	330
Lime with shale	10	340
Lime	115	455
Lime with sand	80	535
Lime	148	683
Sand	127	810
Sand with lime stringers	30	840
Sand	60	900
Sand with shale	15	915
Sand, shale and lime	5	920
Lime and shale	5	925
Shale with lime	10	935
Lime with shale	5	940
Lime	115	1055
Lime white, brown	15	1070
Lime	75	1145
Hard lime	35	1180
Lime	50	1230
Lime with sand	45	1275
Sand with lime	70	1345
Sand	15	1360
Lime with sand	190	1550
Shale	7	1557

A 20-in. diameter hole was drilled to a depth of 34 ft, reduced to 19 in. between 34 and 964 ft, and finished 15 in. in diameter from 964 to 1557 ft. The well is cased with 20-in. black steel pipe from land surface to a depth of 34 ft and 16-in. black steel pipe from land surface to a depth of 964 ft (cemented in).

After the well was shot with 455 qt of nitrogel between 1450 and 1515 ft, a production test was conducted by the driller on March 1-2, 1976. After 22.8 hr of pumping at rates ranging from 960 to 1406 gpm, the maximum drawdown was 100 ft from a nonpumping water level of 570 ft. Thirty min after pumping was stopped, the water level had recovered to 599 ft.

A second production test was conducted by the driller on April 6-7, 1976. After 20 hr of pumping at rates of 986 to 1706 gpm, the drawdown was 110 ft from a nonpumping water level of 570 ft. Pumping was continued for 7 hr at rates ranging from 1496 to 853 gpm with a final drawdown of 70 ft.

A third production test was conducted by the driller on May 4-5, 1976. After 20.2 hr of pumping at rates ranging from 820 to 1980 gpm, the drawdown was 100 ft from a nonpumping water level of 573 ft.

The pumping equipment presently installed is a Johnston vertical turbine pump set at 800 ft, rated at 1000 gpm, and powered by a 400-hp Ideal electric motor.

A partial analysis of a sample (Lab. No. 201598) collected during the second production test, after pumping for 25 hr at rates of 986 to 1706 gpm, showed the water to have a hardness of 228 mg/l, total dissolved minerals of 423 mg/l, and an iron content of 0.9 mg/l.

A description of the wells in the Hadley Bedrock Valley follows:

In 1941, it was noted that during the previous 30 years, nonpumping water levels in the city wells had lowered 200 to 250 ft. In 1942-43, a study was made on two large buried bedrock valleys east of Joliet, which roughly coincide with the existing valleys of Spring and Hickory Creeks and a third, called Hadley Bedrock Valley, which forms a connecting channel between the two. As a result of field studies and reports on the respective hydrologic and geologic factors involved, 11 test wells and a number of observation wells were drilled in an area extending 1 mile in width and from 8 to 10 miles northeast of Joliet. Pumping tests were conducted to determine the potential capabilities of the glacial drift and shallow bedrock aquifers. As a result of this study, 5 gravel wells and 3 deep sandstone wells were constructed.

GRAVEL WELL NO. 1 (Site 6), finished in sand and gravel, was completed in May 1950 to a depth of 103 ft by the Layne-Western Co., Aurora. The well is located east of Gougar Road about 0.4 mile north of U. S. Route 6, approximately 562 ft S and 740 ft E of the NW corner of Section 5, T35N, R11E. The land surface elevation at the well is approximately 650 ft.

A sample study log of Gravel Well No. 1 furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
QUATERNARY SYSTEM		
Pleistocene Series		
Soil, silty, brownish black	1	1
Gravel, sandy, white to gray, dark yellowish orange at top; numerous dolomite pebbles and granules; few calcite grains	74	75
Gravel, light gray to buff; numerous dolomite pebbles, average 5 mm., maximum 8 mm.	30	105

Strata (continued)	Thickness (ft)	Depth (ft)
Sand and gravel, silty; numerous dolomite pebbles and grains; few calcite grains	10	115
Sand, slightly silty, fine to coarse, numerous dolomite grains; few calcite grains	10	125

A 48-in. diameter hole was drilled to a depth of 25 ft and finished 36 in. in diameter from 25 to 103 ft. The well is cased with 48-in. surface pipe from land surface to a depth of 25 ft, 36-in. pipe from land surface to a depth of 50 ft, and 18-in. pipe from about 0.8 ft above land surface to a depth of 63 ft followed by 40 ft of 18-in. No. 6 (0.080 in.) Layne brass shutter screen. The annulus between the 48- and 36-in. casings is filled with cement from 0 to 25 ft and the annulus between the 36- and 18-in. casings and between the bore hole and casing-screen assembly is filled with selected gravel from 0 to 103 ft.

Upon completion, the well reportedly produced 970 gpm for 14 hr with a drawdown of 60 ft from a nonpumping water level of 9 ft below the pump base.

A production test using four observation wells was conducted on June 21-22, 1950, by representatives of the driller, the State Water Survey, and Consoer, Townsend & Associates, Consulting Engineers. After 2.6 hr of pumping at rates of 508 to 950 gpm, the drawdown was 19 ft from a nonpumping water level of 4 ft below land surface. Pumping was continued for 7.5 hr at rates ranging from 717 to 1148 gpm with a drawdown of 25 ft. After an additional 14.2 hr of pumping at a rate of 1280 gpm, the final drawdown was 31 ft. Twenty min after pumping was stopped, the water level had recovered to 11 ft.

In May 1962, the pump was pulled and the well was cleaned to the bottom. The column pipe and screen were replaced where needed.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73353) set at about 85 ft, rated at 1000 gpm, and powered by a 50-hp 1800 rpm U. S. electric motor (Serial No. 818311). The well is equipped with 85 ft of airline.

A mineral analysis of a sample (Lab. No. 157250) collected April 13, 1962, showed the water to have a hardness of 731 mg/l, total dissolved minerals of 905 mg/l, and an iron content of 2.9 mg/l.

GRAVEL WELL NO. 2 (Site 2),finished in sand and gravel, was completed in May 1950 to a depth of 90 ft by the Layne-Western Co., Aurora. The well is located on the south side of U. S. Route 6 about 0.2 mile east of Gougar Road, approximately 2500 ft N and 980 ft E of the SW corner of Section 5, T35N, R11E. The land surface elevation at the well is approximately 668 ft. (12)

A 48-in. diameter hole was drilled to a depth of 25 ft and finished 36 in. in diameter from 25 to 90 ft. The well is cased with 48-in. steel pipe from land surface to a depth of 25 ft, 36-in. pipe from land surface to a depth of 50 ft, and 18-in. steel pipe from about 3 ft above the pumphouse floor to a depth of 60 ft followed by 30 ft of 18-in. No. 6 (0.080 in.) Layne bronze shutter screen. The annulus between the 48- and 36-in. casings is filled with cement from 0 to 25 ft and the annulus between the 36- and 18-in. casings and between the bore hole and casing-screen assembly is filled with 1/16 to 1/8 in. gravel from 0 to 90 ft.

A production test using one observation well was conducted on May 11-12, 1950, by representatives of the driller and the State Water Survey. After 7.9 hr of pumping at rates of 195 to 812 gpm, the drawdown was 47.5 ft from a nonpumping water level of 28.5 ft below land surface. Fifteen min after pumping was stopped, the water level had recovered to 30.5 ft. Pumping was then continued for 15.3 hr at a rate of 609 gpm with a final drawdown of 34.5 ft.

In November 1963, the pump was pulled and the well was cleaned to the bottom. Parts were replaced where needed.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73351) set at 70 ft, rated at 600 gpm, and powered by a 50-hp 1800 rpm U. S. electric motor (Serial No. 817302). The well is equipped with 70 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B052947) of a sample collected April 30, 1981, after pumping for 24 hr at 575 gpm, showed the water to have a hardness of 498 mg/l, total dissolved minerals of 604 mg/l, and an iron content of 2.23 mg/l.

GRAVEL WELL NO. 3 (Site 5), finished in sand and gravel, was completed in August 1950 to a depth of 83 ft by the Layne-Western Co., Aurora. The well is located east of Gougar Road about 0.5 mile south of U. S. Route 6, approximately 60 ft S and 540 ft E of the NW corner of Section 8, T35N, R11E. The land surface elevation at the well is approximately 674 ft. (13)

A drillers log of Gravel Well No. 3 follows:

Strata	Thickness (ft)	Depth (ft)
Water	4	4
Concrete	1.5	5.5
Sand, rock cuttings	18.5	24
Concrete	3	27
Clay	21.5	48.5
Coarse gravel and boulders	34.5	83
Blue clay below		

A 48-in. diameter hole was drilled to a depth of 25 ft and finished 36 in. in diameter from 25 to 83 ft. The well is cased with 48-in. steel pipe from land surface to a depth of 25 ft, 36-in. pipe from 2 ft above land surface to a depth of 50.8 ft, and 18-in. steel pipe from about 1.5 ft above the pumphouse floor to a depth of 58 ft followed by 25 ft of 18-in. No. 6 (0.080 in.) Layne bronze shutter screen. The

annulus between the 48- and 36-in. casings is filled with cement from 0 to 25 ft and the annulus between the 36- and 18-in. casings and between the bore hole and casing-screen assembly is filled with pea gravel and flint sand from 0 to 83 ft.

A production test using one observation well was conducted on August 14, 1950, by representatives of the driller and Consoer, Townsend & Associates, Consulting Engineers. After 1.3 hr of pumping at rates of 421 to 433 gpm, the drawdown was 6.6 ft from a nonpumping water level of 35.3 ft below land surface. Pumping was continued for 1.7 hr at a rate of 618 gpm with a drawdown of 10.5 ft. Pumping was continued for 1.7 hr at a rate of 805 gpm with a drawdown of 14.0 ft. After an additional 19.3 hr of pumping at rates ranging from 1007 to 1227 gpm, the final drawdown was 27.0 ft. Twenty min after pumping was stopped, the water level had recovered to 43.8 ft.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73352) set at 78 ft, rated at 1200 gpm, and powered by a 50-hp 1800 rpm U. S. electric motor (Serial No. 818313). The well is equipped with 78 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. C007017) of a sample collected April 9, 1974, after pumping for 8 hr at 850 gpm, showed the water to have a hardness of 544 mg/l, total dissolved minerals of 634 mg/l, and an iron content of 2.4 mg/l.

GRAVEL WELL NO. 4 (Site 9), finished in sand and gravel, was completed in September 1950 to a depth of 113 ft by the Layne-Western Co., Aurora. The well is located about 0.8 mile north of U. S. Route 6 and 0.7 mile east of Gougar Road, approximately 1863 ft N and 1700 ft W of the SE corner of Section 32, T36N, R11E. The land surface elevation at the well is approximately 688 ft. (14)

A drillers log of Gravel Well No. 4 follows:

Strata	*Thickness (ft)*	*Depth (ft)*
Top soil	1	1
Blue clay and boulders	39	40
Boulders	30	70
Fine sand	40	110
Cemented gravel	2	112
Blue clay below		

A 48-in. diameter hole was drilled to a depth of 25 ft and finished 36 in. in diameter from 25 to 113 ft. The well is cased with 48-in. pipe from land surface to a depth of 25 ft, 36-in. pipe from 1.5 ft above land surface to a depth of 52 ft, and 18-in. pipe from 2 ft above land surface to a depth of about 73 ft followed by 40 ft of 18-in. No. 6 (0.080 in.) Layne brass shutter screen. The annulus between the 48- and 36-in. casings is filled with cement from 0 to 25 ft and the annulus between the 36- and 18-in. casings and between the bore hole and casing-screen assembly is filled with pea gravel and flint sand from 0 to 113 ft.

A production test using one observation well was conducted on September 8-9, 1950, by representatives of the driller and Consoer, Townsend & Associates, Consulting Engineers. After 17 hr of pumping at a rate of 1130 gpm, the drawdown was 22.0 ft from a nonpumping water level of 34.8 ft below land surface. Pumping was continued for 6 hr at rates of 901 to 458 gpm with a drawdown of 7.0 ft. After an additional 1.5 hr of pumping at rates of 1120 to 1125 gpm, the final drawdown was 21.0 ft. Ten min after pumping was stopped, the water level had recovered to 35.0 ft.

In 1963, the pump was pulled and the well was cleaned to the bottom. Parts were replaced where needed.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73355) set at 101 ft, rated at 1000 gpm, and powered by a 50-hp 1800 rpm U. S. electric motor (Serial No. 818581). The well is equipped with 101 ft of airline.

A partial analysis of a sample (Lab. No. 163084) collected June 1, 1964, showed the water to have a hardness of 540 mg/l, total dissolved minerals of 676 mg/l, and an iron content of 1.6 mg/l.

GRAVEL WELL NO. 5 (Site 3), finished in sand and gravel, was completed in August 1950 to a depth of 94 ft by the Layne-Western Co., Aurora. The well is located about 0.6 mile north of U. S. Route 6 and 0.5 mile east of Gougar Road, approximately 579 ft N and 2740 ft E of the SW corner of Section 32, T36N, R11E. The land surface elevation at the well is approximately 662 ft. (15)

A drillers log of Gravel Well No. 5 follows:

Strata	*Thickness (ft)*	*Depth (ft)*
Clay	25	25
Blue gravelly clay	5	30
Gravel with large rocks	5	35
Hard packed gravel	20	55
Gravel	15	70
Loose gravel	25	95

A 48-in. diameter hole was drilled to a depth of 25 ft and finished 36 in. in diameter from 25 to 94 ft. The well is cased with 48-in. steel pipe from land surface to a depth of 25 ft, 36-in. pipe from land surface to a depth of 50 ft, and 18-in. steel pipe from about 0.4 ft above the wellhouse floor to a depth of about 59 ft followed by 35 ft of 18-in. No. 6 (0.080 in.) Layne shutter screen. The annulus between the 48- and 36-in. casings is filled with cement from 0 to 25 ft and the annulus between the 36- and 18-in. casings and between the bore hole and casing-screen assembly is filled with gravel from 0 to 94 ft.

A production test using one observation well was conducted on August 21-22, 1950, by representatives of the driller and Consoer, Townsend & Associates, Consulting Engineers. After 18 hr of pumping at a rate of 1018 gpm, the drawdown was 47.0 ft from a nonpumping water level of 16.8 ft below land surface. Pumping was continued for 5.5 hr at rates of 805 to 408 gpm with a drawdown of 22.0

ft. After an additional 30 min of pumping at an increased rate of 1029 gpm, the final drawdown was 47.5 ft. Twenty min after pumping was stopped, the water level had recovered to 18.3 ft.

In 1963, the pump was pulled and the well was cleaned to the bottom. The column pipe was replaced where needed.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73354) set at about 85 ft, rated at 1000 gpm, and powered by a 50-hp 1800 rpm U. S. electric motor (Serial No. 818313). The well is equipped with 84 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B43425) is for a water sample from the well collected April 27, 1977, after 24 hr of pumping at 420 gpm.

GRAVEL WELL NO. 5, LABORATORY NO. B43425

		mg/l	me/l			mg/l	me/l
Iron	Fe	2.4		Silica	SiO_2	14	
Manganese	Mn	0.04		Fluoride	F	0.3	0.02
Ammonium	NH_4	0.28	0.02	Boron	B	0.3	
Sodium	Na	21	0.91	Cyanide	CN	0.00	
Potassium	K	3.3	0.08	Nitrate	NO_3	0.0	0.00
Calcium	Ca	140	6.99	Chloride	Cl	4.4	0.12
Magnesium	Mg	58	4.77	Sulfate	SO_4	290	6.03
				Alkalinity (as $CaCO_3$)		330	6.60
Arsenic	As	0.00		Hardness (as $CaCO_3$)		600	12.00
Barium	Ba	0.0					
Cadmium	Cd	0.00		Total dissolved			
Chromium	Cr	0.00		minerals		791	
Copper	Cu	0.01					
Lead	Pb	0.00					
Mercury	Hg	0.0000					
Nickel	Ni	0.0					
Selenium	Se	0.00					
Silver	Ag	0.00					
Zinc	Zn	0.0		pH (as rec'd)		7.3	

ROCK WELL NO. 1 (Site 6, Warren – also known as Well 8D), open to the Cambrian-Ordovician aquifer, was completed in August 1949 to a depth of 1660 ft by the J. P. Miller Artesian Well Co., Brookfield. The well is located north of U. S. Route 6 and east of Gougar Road in the same pumphouse as Gravel Well No. 1, approximately 562 ft S and 730 ft E of the NW corner of Section 5, T35N, R11E. The land surface elevation at the well is approximately 648 ft.

A drillers log of Rock Well No. 1 follows:

Strata	Thickness (ft)	Depth (ft)
Surface material	8	8
Gravel	8	16
Sand and gravel	12	28
Sand	62	90
Gravel	15	105
Blue mud and gravel	11	116
Sand and gravel	14	130
Gray lime	205	335
Lime	10	345
Shale	5	350
Lime and shale breaks	5	355
Shale	6	361
Lime	84	445
Shale	3	448
Lime	7	455
Shale	2	457
Lime	20	477
Shale	80	557
Lime and shale	11	568
Brown lime	84	652
Gray lime	33	685
Brown lime	128	813
White sand	215	1028
Lime	335	1363
Broken and green shale lime	20	1383
Brown lime	92	1475
Sand	139	1614
Limestone and shale	46	1660

A 28-in. diameter hole was drilled to a depth of 652 ft, reduced to 19 in. between 652 and 1028 ft, and finished 15 in. in diameter from 1028 to 1660 ft. The well is cased with 28-in. ID pipe from land surface to a depth of 140 ft, 19-in. ID pipe from about 0.8 ft above the pumphouse floor to a depth of 652 ft (cemented in), and a 15-in. liner from 955 ft to a depth of 1028 ft.

Between August and November 1949, this well was shot at five levels as follows: 400 lb of nitrogel between 1597.6 and 1610 ft, 400 lb of gel between 1572.6 and 1585 ft, 600 lb of gel and 10 lb primer between 1612 and 1625 ft, 500 lb of gel between 1584 and 1594 ft, and 400 lb of gel between 1563 and 1575 ft. Sandstone was found to be very soft and caved into the well. Bailing was discontinued at 1608 ft in February 1950.

A production test was conducted on March 6-7, 1950, by representatives of the driller, the State Water Survey, and Consoer, Townsend & Associates, Consulting Engineers. After 15.8 hr of pumping at rates ranging from 475 to 1005 gpm, the final drawdown was 164 ft from a nonpumping water level of 427 ft.

A second production test was conducted on March 24-25, 1950, by representatives of the driller and Consoer, Townsend & Associates, Consulting Engineers. After 17.7 hr of pumping at rates ranging from 800 to 1040 gpm, the final drawdown was 160 ft from a nonpumping water level of 425 ft. Four hr after pumping was stopped, the water level had recovered to 444 ft.

From May to November 1962, the pump was pulled and the well was cleaned to the bottom.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73356) set at 950 ft, rated at 900 gpm, and powered by a 300-hp 1800 rpm U. S. electric motor (Serial No. 818501). The well is equipped with 950 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B052854) of a sample collected April 29, 1981, after pumping for 24 hr, showed the water to have a hardness of 251 mg/l, total dissolved minerals of 530 mg/l, and an iron content of 0.37 mg/l.

ROCK WELL NO. 2 (Site 5, Woodruff – also known as Well 7D), open to the Cambrian-Ordovician aquifer, was completed in May 1950 to a depth of 1701 ft by the J. P. Miller Artesian Well Co., Brookfield. The well is located east of Gougar Road in the same pumphouse as Gravel Well No. 3, approximately 60 ft S and 530 ft E of the NW corner of Section 8, T35N, R11E. The land surface elevation at the well is approximately 674 ft.

A sample study summary log of Rock Well No. 2 furnished by the State Geological Survey follows:

Strata	*Thickness (ft)*	*Depth (ft)*
QUATERNARY SYSTEM		
Pleistocene Series		
Till, clayey, dark yellowish orange	14	14
Till, silty, yellowish gray	56	70
Sand, gravel to ½ in., yellowish gray	20	90
Till, silty, gray	15	105
Gravel to ½ in., yellowish gray	7	112
SILURIAN SYSTEM		
Niagaran Series		
Dolomite, silty, light yellowish gray, fine to very fine; dolomite, yellowish gray, pink, green at base	118	230
Alexandrian Series		
Dolomite, light yellowish gray to dark yellowish gray, fine	75	305
ORDOVICIAN SYSTEM		
Maquoketa Group		
Dolomite, light yellowish gray to yellowish brown, fine	70	375
Shale, dark yellowish gray, weak	60	435
Galena Group		
Dolomite, light yellowish gray, fine to coarse	195	630
Platteville Group		
Dolomite, light yellowish brown, fine to coarse	145	775
Ancell Group	--	
Glenwood Formation		
Limestone, light yellowish gray to light yellowish brown, very fine; sandstone, gray, fine to coarse, incoherent	20	795
St. Peter Sandstone		
Sandstone, light gray, very fine to coarse, incoherent, shale, yellowish gray to green, weak at base	115	910
Canadian Group		
Shakopee Dolomite		
Dolomite, light yellowish brown, very fine to medium; sandstone, light gray, medium to coarse, incoherent; shale, light green, weak	30	940
Oneota Dolomite		
Dolomite, light yellowish gray, white, pink, fine to coarse; shale, pink, light green, weak at base	260	1200
CAMBRIAN SYSTEM		
Eminence-Potosi Dolomite		
Dolomite, light yellowish brown, fine to medium	163	1363
Franconia Formation		
Dolomite, purplish pink, grayish green, fine to coarse; sandstone light gray, incoherent to compact; dolomite, gray to brownish gray, fine to medium	132	1495
Ironton Sandstone		
Sandstone, light gray, very fine to coarse, incoherent	55	1550
Galesville Sandstone		
Sandstone, light gray, very fine to very coarse, incoherent to compact	115	1665
Eau Claire Formation		
Dolomite, grayish brown, fine to medium; shale, yellowish gray, weak; sandstone, yellowish gray, fine to compact	35	1700

A 27-in. diameter hole was drilled to a depth of 141 ft, reduced to 20 in. between 141 and 1294 ft, and finished 15 in. in diameter from 1294 to 1701 ft. The well is cased with 28-in. OD pipe from land surface to a depth of 113.5 ft, 20-in. OD pipe from about 0.8 ft above the pumphouse floor to a depth of 549 ft (cemented in), and a 16-in. OD liner from 1183 ft to a depth of 1303 ft.

On May 23, 1950, the well was shot with 400 lb of 100 percent nitrogel and 60 lb of 60 percent dynamite between the depths of 1623 and 1635 ft following which the well was filled with sand up to 1600 ft.

A production test was conducted on June 26, 1950, by representatives of the driller, the State Water Survey, and Consoer, Townsend & Associates, Consulting Engineers. After 6 hr of pumping at rates of 515 to 990 gpm, the drawdown was 95 ft from a nonpumping water level of 457 ft. After a 17-min idle period, pumping was continued for 17.1 hr at rates ranging from 1100 to 1040 gpm with a drawdown of 128 ft. After an additional 1.6 hr of pumping at rates ranging from 905 to 630 gpm, the drawdown was 99 ft.

On June 6, 1960, the pump was removed because of a leak in the shaft tubing. The well had filled up to 1606 ft and 130 cubic yards of sand was removed. The nonpumping water level was reported to be 533 ft.

In 1963, the pump was pulled, the well was cleaned to the bottom, and the pump was placed at a lower depth. Column pipe was replaced as needed.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73358) set at 960 ft, rated at 900 gpm, and powered by a 500-hp 1770 rpm Ideal electric motor.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B052853) of a sample collected April 29, 1981, after pumping for 24 hr, showed the water to have a hardness of 261 mg/l, total dissolved minerals of 573 mg/l, and an iron content of 0.33 mg/l.

ROCK WELL NO. 3 (Site 1, Briick Farm – also known as Well 6D), open to the Cambrian-Ordovician aquifer, was completed in March 1950 to a depth of 1656 ft by the J. P. Miller Artesian Well Co., Brookfield. This well is not in use. The well is located east of Farrell Road about 0.6 mile north

of U. S. Route 6, approximately 560 ft N and 570 ft E of the SW corner of Section 31, T36N, R11E. The land surface elevation at the well is approximately 642 ft.

A drillers log of Rock Well No. 3 follows:

Strata	*Thickness (ft)*	*Depth (ft)*
Surface	14	14
Gray	26	40
Sand	35	75
Blue mud	23	98
Lime	108	206
Shale	2	208
Lime and shale	10	218
Green shale	9	227
Lime	88	315
Lime and shale breaks	13	328
Shale	10	338
Lime and shale	9	347
Shale	81	428
Lime	31	459
Lime and shale break	4	463
Lime	137	600
Gray lime	30	630
Brown lime	135	765
St. Peter sand	495	1260
Red mud	1	1261
Lime	5	1266
Red mud	6	1272
Red mud and lime	11	1283
Lime shell and red mud	95	1378
Red rock	9	1387
Gray shale and lime	19	1406
Green lime	4	1410
Shale and lime	7	1417
Brown lime	21	1438
Shale	4	1442
Lime	23	1465
Sand	144	1609
Green lime and shale	47	1656

A 25-in. diameter hole was drilled to a depth of 577 ft, reduced to 19 in. between 577 and 1451 ft, and finished 16 in. in diameter from 1451 to 1656 ft. The well is cased with 26-in. steel pipe from land surface to a depth of 104 ft, 20-in. OD steel pipe from about 1.5 ft above the pumphouse floor to a depth of 577 ft (cemented in), and 16-in. steel liner from 1210 ft to a depth of 1451 ft.

On April 21, 1950, the well reportedly produced 660 gpm for 5 hr with a drawdown of 166 ft from a nonpumping water level of 434 ft below land surface.

A production test was conducted on May 25-26, 1950, by representatives of the driller and the State Water Survey. After 20.2 hr of pumping at rates ranging from 355 to 795 gpm, the final drawdown was 153 ft from a nonpumping water level of 447 ft below land surface. Fifty min after pumping was stopped, the water level had recovered to 488 ft.

From November 1961 to March 1962, the pump was pulled and the well was cleaned to the bottom.

The pumping equipment presently installed is a Peerless turbine pump (Serial No. 73357) set at 950 ft, rated at 900 gpm, and powered by a 300-hp 1800 rpm U. S. electric motor (Serial No. 818503).

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B43412) is for a water sample from the well collected April 25, 1977, after 24 hr of pumping at 750 gpm.

ROCK WELL NO. 3, LABORATORY NO. B43412

		mg/l	*me/l*			*mg/l*	*me/l*
Iron	Fe	0.3		Silica	SiO_2	6.9	
Manganese	Mn	0.01		Fluoride	F	1.4	0.07
Ammonium	NH_4	0.98	0.05	Boron	B	0.7	
Sodium	Na	92	4.00	Cyanide	CN	0.00	
Potassium	K	14.9	0.38	Nitrate	NO_3	0.0	0.00
Calcium	Ca	64	3.19	Chloride	Cl	54	1.52
Magnesium	Mg	22	1.81	Sulfate	SO_4	130	2.70
				Alkalinity (as $CaCO_3$)		265	5.30
Arsenic	As	0.00		Hardness (as $CaCO_3$)		256	5.12
Barium	Ba	0.0					
Cadmium	Cd	0.00		Total dissolved			
Chromium	Cr	0.00		minerals		578	
Copper	Cu	0.03					
Lead	Pb	0.00					
Mercury	Hg	0.0002					
Nickel	Ni	0.0					
Selenium	Se	0.00					
Silver	Ag	0.00					
Zinc	Zn	0.0		pH (as rec'd)		7.6	

JOLIET CORRECTIONAL CENTER

Joliet Correctional Center (est. 1780), located on the north edge of Joliet east of Route 171, installed a public water supply in 1926. One well (No. 2) is in use. In 1952 the estimated average pumpage was 350,000 to 400,000 gpd. In 1979 the estimated average and maximum pumpages were 300,000 and 400,000 gpd, respectively. The water is chlorinated.

WELL NO. 1, finished in the St. Peter Sandstone, was constructed prior to 1917 to a depth of 575 ft and deepened prior to 1933 to a reported depth of about 780 ft. This well was abandoned in 1952. The well is located back of the general kitchen, approximately 2915 ft N and 3240 ft W of the SE corner of Section 3, T35N, R10E. The land surface elevation at the well is approximately 550 ft.